CHAPTER 4.0: PAST, CURRENT, AND PROJECTED WATER DEMANDS

4.1 WATER DEMAND FACTORS

Over the long-term, urban water demand is a function of climate, land use, population, and institutional factors, all of which affect the amount of water consumed. In the short-term, water demand varies considerably on a seasonal, daily, and hourly basis. Both long-term trends and short-term fluctuations in water demand are significant criteria incorporated in the design of water storage, treatment and distribution systems.

Variances in demand are related to a number of factors, including, but not necessarily limited to:

- Temperature and rainfall fluctuations.
- Variations in lawn irrigation use associated with differences in residential density and lot size.
- Variations in the number of persons per household.
- Variations in the concentration of water intensive residential or commercial land uses.
- Differences in greenbelt landscaping requirements.
- Maturity of residential outdoor landscaping.
- Differences in the degree of implementation of water conservation measures.
- Economic growth or recession.

4.2 HISTORICAL WATER USE

Table 4.2-1: Historical Water Demand illustrates historical information related to total water production, size of the YLWD service area, and annual rainfall from 1930 to 2004. The table indicates the change from a rural agricultural community to Yorba Linda's current status as a suburban residential community. In addition, this table correlates the historical water demand to the annual rainfall to exemplify the increased demand during dry years and decreased demand during wet years.

Table 4.2 – 1: Historical Water Demand

Year	Demand (AFY)	Service Area (sq. miles)	Annual Rainfall (in)
1930	3,507	7.4	15.75
1940	3,707	7.4	11.09
1950	3,905	7.4	10.36
1960	4,708	8.6	9.38
1970	5,630	8.6	9.14
1980	11,542	21.3	27.53
1985	14,214	21.3	11.88
1990	19,489	21.3	7.43
1995	18,043	21.3	22.95
1996	19,668	21.3	22.22
1997	20,868	21.3	15.45
1998	18,160	21.3	28.41
1999	22,243	21.3	5.37
2000	21,981	22.7	10.19
2001	21,577	22.7	15.33
2002	23,457	22.7	6.45
2003	22,640	22.7	11.04
2004	23,243	22.7	13.46

The following graph, Figure 4.2-1: Historical Water Demand, illustrates the significant demand increase within the past 75 years. This increase is primarily attributed to population increases and land use changes.

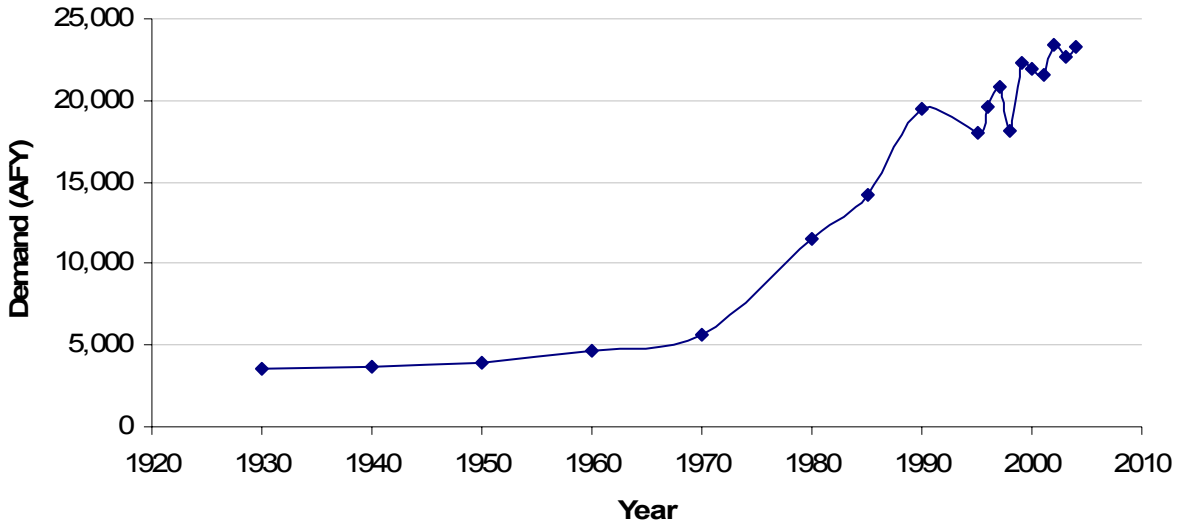

Figure 4.2- 1: Historical Water Demand

4.3 CURRENT WATER USE

4.3.1 Current Residential Water Use

In order to forecast future water consumption and to determine potential water savings from conservation measures, it is important to determine the major areas of water usage. YLWD's residential customers use approximately 50% of their water inside the home for water closets, bath, laundry, kitchen and cooking. The remaining 50% of residential water use is outside the home for landscaping and other outdoor requirements.

4.3.1 Customer Classifications

Water customers within the YLWD are categorized into five major classes: Residential, Commercial & Industrial, Landscape, Agricultural and Private Fire Service. The Private Fire Service meters do not register water use. The following table illustrates the number of metered accounts and total water use for each customer class.

Table 4.3 – 1: Service Connections by Customer Categories (2003)

Customer Category	Number of Connections	Percent of Total Connections	Percent of Water Use
Residential	20,583	92%	71%
Commercial and Industrial	1,059	5%	9%
Landscape	772	3%	16%
Agricultural	29	<1%	<1%
Untreated Water	1	<1%	3%
Total	**22,417**	**100%**	**100%**

Source: 2005 Domestic Water System Master Plan

4.4 PROJECTED WATER USE

4.4.1 Recent Per Capita Consumption Trends

The average daily per capita demand is a useful measure for evaluating the historic water demands in connection with population and planning projections. Table 4.4 – 1: Recent Per Capita Water Consumption displays the historic gallons per capita day (GPCD) water demand for YLWD from 2000 to present. Since YLWD's service area has changed significantly within the past twenty years, the per capita consumption was calculated over the past five years in order to reflect current consumption trends. The per capita consumption amount represents the overall average water use, including residential, commercial, and public uses as well as any losses within the water distribution system.

Table 4.4 – 1: Recent Per Capita Water Consumption

Year	Acre–Feet Per Year	Population	Gallons Per Capita Per Day Water Use
2000	21,981	67,462	291
2001	21,577	68,117	283
2002	23,457	69,288	302
2003	22,640	71,186	284
2004	23,243	72,535	286
Average			**289**

Traditionally, per capita consumption rates in fully developed areas tend to increase at a low annual growth rate. As shown in Figure 4.4 – 1: Historic GPCD as a Function of Population, the annual per capita demand has generally remained stagnant, while the population has increased significantly. This trend can be attributed to the implementation of long–term water use efficiency measures, temporal, and economic factors.

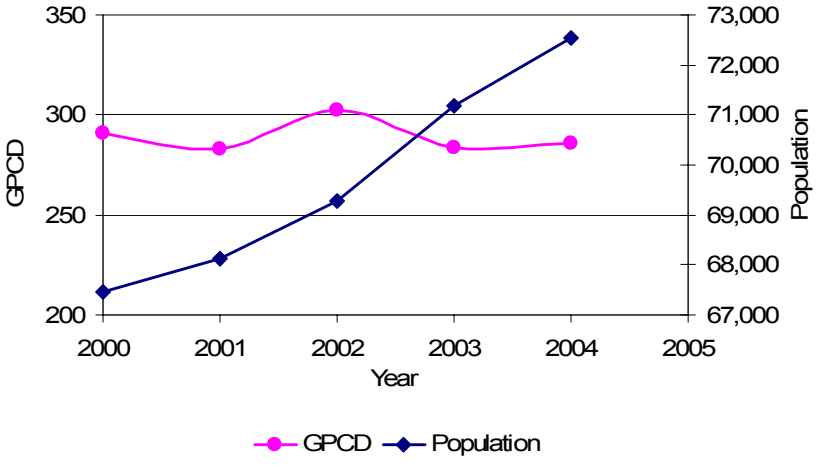

Figure 4.4 – 1: Historic GPCD as a Function of Population

4.4.2 Projected Water Demand

Summarized in Table 4.4 – 2: Projected Per Capita Water Consumption are projected values for water consumption in measures of both gallons per day (GPD) and acre–feet per year (AFY). Projections were prepared based on a population projection study prepared by California State University, Fullerton (including 3.2 people per connection outside the City of Yorba Linda), and the average gallons per capita day water use calculated in Table 4.4 – 1: Historic Per Capita Water Consumption.

Table 4.4 – 2: Projected Per Capita Water Consumption

Year	Population	Gallons Per Day	Acre Feet Per Year
2005	75,445	21,816,115	24,438
2010	80,007	23,135,289	25,916
2015	82,584	23,880,470	26,751
2020	84,155	24,334,749	27,260
2025	84,860	24,538,611	27,488
2030	85,355	24,681,748	27,648

Figure 4.4 – 2: Projected Water Use as a Function of Population demonstrates the dependence of water consumption projections on population increases. Discrepancies may appear to exist between the historic trends featured in Figure 4.4 – 1: Historic GPCD as a Function of Population and the projected values. This is attributed to variances in weather, water conservation, and economic stability, which were not factored into the projections.

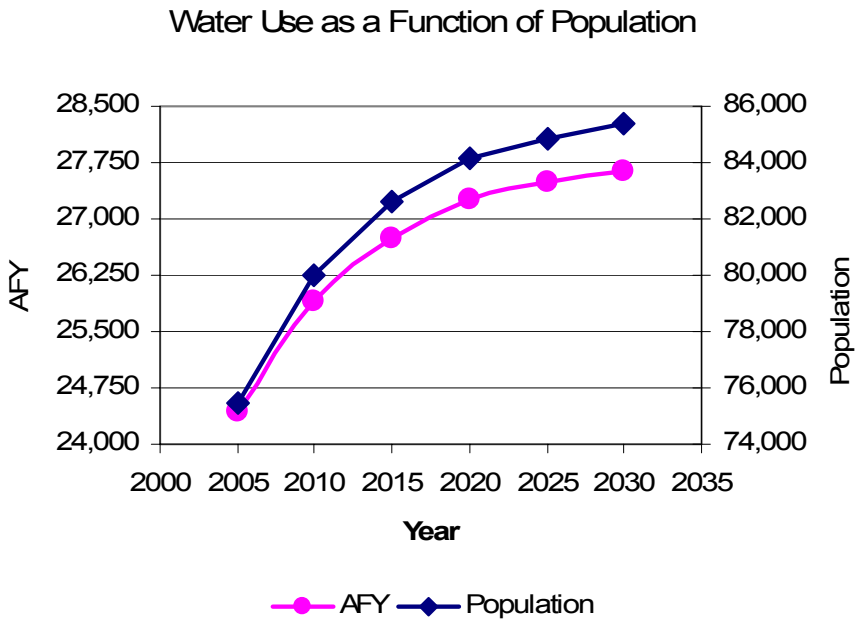

Figure 4.4 – 2: Projected Water Use as a Function of Population

4.5 PAST, CURRENT, AND PROJECTED WATER DEMANDS

4.5.1 Water Use by Customer Type

Table 4.5 – 1: Past, Current, and Projected Water Deliveries below illustrates water deliveries for the Yorba Linda Water District. The water use is divided into the Municipal & Industrial and Agricultural sectors for the purpose of this UWMP. The total metered deliveries varies slightly from the projected per capita water consumption calculations (Table 4.4-2: Projected Per Capita Water Consumption) due to the variances incorporated into the "Water Balance Model" developed by the regional water purveyor. The regional calculations are based on fiscal year projections (using 40% demand during winter months and 60% demand during summer months) and a combination of 83 years of historical hydrology (from 1922 to 2004) to develop estimates of water supply and demand in Orange County over the 25-year planning horizon. Completing the supply and demand calculations on a regional level enables the development of realistic projections. While historical data for YLWD was recorded in terms of the calendar year, projections for this UWMP are provided for the fiscal year to ensure consistency with regional plans. As a result, the demand projections provided in the following table are utilized for the subsequent reliability analysis.

Table 4.5 – 1: Past, Current, and Projected Water Deliveries

Fiscal Year	Metered Deliveries Per Water Use Sector (AFY)		Total Metered Deliveries (AFY)
	Municipal & Industrial	Agricultural	
2000	22,572	249	22,820
2005	24,587	44	24,631
2010	25,995	44	26,039
2015	26,795	44	26,838
2020	27,273	44	27,317
2025	27,494	44	27,537
2030	27,637	44	27,680

Note: the number of accounts is not available and unmetered deliveries are zero

4.5.2 Sales to Other Agencies

Historically, YLWD does not sell water to other agencies. However, the YLWD has emergency interconnections with the City of Brea, City of Anaheim, and the Golden State Water Company and will supply water to these agencies under existing mutual aid agreements.

4.5.3 Additional Water Uses and Losses

The UWMP accounts for additional water uses and losses as part of the water demand featured in Table 4.5 – 1: Past, Current, and Projected Water Deliveries, however; unaccounted for water losses average approximately 4% of the total water use (as calculated in the 2005 YLWD Domestic Water System Master Plan).

Water taken out of the distribution system at metered connections is relatively easy to measure. Unfortunately, not all water that leaves the system does so at metered connections. Water that exits the distribution system and cannot be measured or accounted for is known as unaccounted-for water. Unaccounted-for water can be estimated by calculating the difference between known water consumption and water production. Most water systems experience a difference of 5 to 10 percent, which is generally considered acceptable.

Table 4.5 – 2: Unaccounted-for Water

Year	Water Production (AFY)	Water Consumption (AFY)	Unaccounted-for Water
1994	17,776	17,806	0%
1995	18,043	17,721	2%
1996	19,668	19,255	2%
1997	20,868	20,078	4%
1998	18,160	16,618	8%
1999	22,243	20,422	8%
2000	21,980	21,267	3%
2001	21,577	20,824	3%
2002	23,457	21,988	6%
2003	22,640	21,119	7%
Average			**4%**

Source: 2005 YLWD Domestic Water System Master Plan

4.5.4 Total Water Use

The total water demand calculated throughout this chapter, including unaccounted for system losses, is summarized in Table 4.5 – 3: Total Water Use (AFY) and Figure 4.5 – 1: Past, Current, and Projected Water Deliveries below.

Table 4.5 – 3: Total Water Use (AFY)	
Year	**Water Use**
2000	22,820
2005	24,631
2010	26,039
2015	26,838
2020	27,317
2025	27,537
2030	27,680

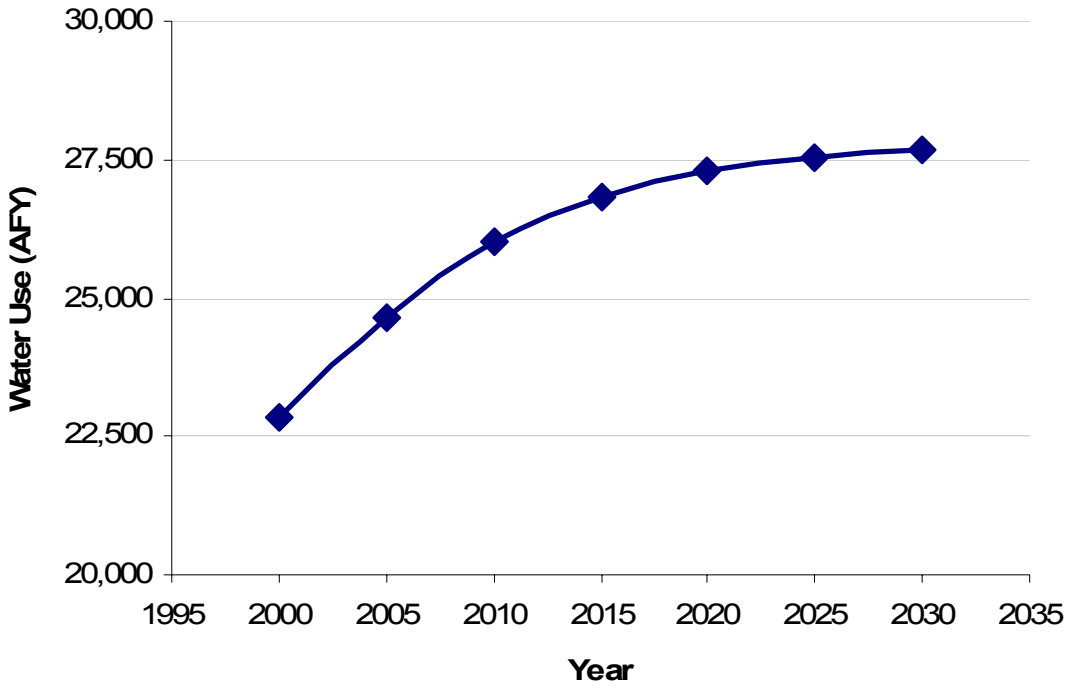

Figure 4.5 – 1: Past, Current, and Projected Water Deliveries